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ABSTRACT

This report is based upon the Survey of Scientific and Engineering (S/E) Personnel Employed at Universities and Colleges, January 1979, which was mailed to 320 institutions of higher education granting doctoral degrees in the sciences and/or engineering. Data are discussed and presented in chart form concerning numbers of full- and part-time scientists and engineers employed by doctorate-granting universities by field, and the twenty leading doctorate-granting institutions employing scientists and engineers. (CS)

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SCIENCE RESOURCES STUDIES HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION WASHINGTON, D.C. 20550 APRIL 30, 1980 NSF 80-309

Academic Employment of Scientists and Engineers Increased 4% in Doctorate Institutions in 1979

This report is based upon the Survey of Scientific and Engineering Personnel Employed at Universities and Colleges, January 1979, which was mailed to 320 institutions of higher education granting doctoral degrees in the sciences and/or engineering. Estimates made by the National Science Foundation for nonrespondents represent 7 percent of the science and engineering total.

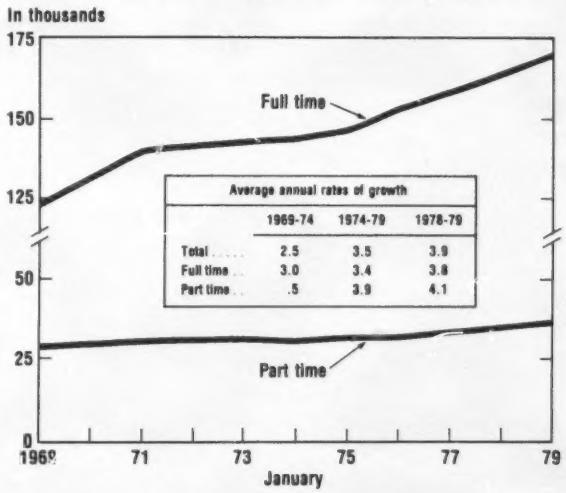
Highlights

- The number of professional scientific and engineering (S/E) personnel employed at doctorate-granting institutions increased 4 percent between January 1978 and January 1979, matching the 4 percent per year average growth rate of the previous four years. During the period 1974-78 doctorate universities, which employ three of every five academic scientists and engineers, accounted for 62 percent of the total S/E increase.
- The growth in S/E employment experienced since 1974 is expected to slow during the early eighties as a result of an anticipated leveling off or decline in enrollment due to demographic factors. A likely impact from this development, when viewed in light of the expected slowing rate of retirements among existing faculty, is a decline in future positions for new faculty. As the rate of faculty growth slows, universities may turn increasingly to part-time appointments to meet basic staffing needs.
- In terms of net change, the public university sector accounted for all of the 1979 S/E growth; private institutions as a group reported a decline (less than 1 percent) even though 14 of the 20 largest private universities in terms of S/E employment reported personnel growth.
- The number of professionals increased in all seven major S/E disciplines and was led by the mathematical and computer sciences—up 6 percent.
- The number of full-time-equivalent (FTE) scientists and engineers in research and development remained at the 1978 level. Only three S/E areas showed increases in 1979—the environmental sciences, life sciences, and engineering.

Employment Status

The number of full- and part-time scientists and engineers expanded 4 percent each at doctorate-granting universities between 1978 and 1979 (chart 1). Numerically, doctorate universities accounted for most of the full-time S/E employment growth in academe during the seventies. At these institutions, the average annual growth of full-timers (3 percent per year) between 1969 and 1979, exceeded the rate for part-timers (2 percent per year). The leading 100 doctorate institu-

Chart 1. Scientists and engineers employed at doctorate-granting institutions by status



SOURCE: National Science Foundation

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Prepared in the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies

tions in terms of R&D expenditures accounted for more than four-fifths of all academic R&D spending and graduate S/E enrollment in 1978, and nearly three-fourths of total academic S/E professional employment in 1979.

Although there is general concern about the impact on academe resulting from the projected decline in post-secondary enrollment forecast for the eighties, a recent study by the National Research Council has concluded that the leading performers of academic research and development may be better suited to control the size of their enrollment and number of faculty against demographic changes. The study claims that "it is doubtful that demographic effects will be felt as much at the major research institutions, which tend to have strong markets relative to the rest of higher education."[1]

Part-time S/E employment at doctorate institutions has remained steady at about 18 percent, the same share reported in 1969. This contrasts sharply with institutions granting less than an S/E doctorate degree, where the part-time share has increased from 19 percent in 1969 to 28 percent in 1978 (chart 2). This reflects changes in the characteristics of enrollment at community and junior colleges.

A combination of economic and demographic conditions have been responsible for the increasing utilization of part-time S/E professionals in some academic institutions. This shift has been accompanied by changes in the makeup of college enrollment during the seventies when the number of part-time students relative to the total was also increasing.[2] The relationship between these two developments is not immediately obvious. It is possible, however, that the two may be related. As part-time enrollment has grown, there have been curriculum changes which created additional job-related courses. This could account for the addition of part-time S/E professionals since, according to several institutional administrators, the positions could be filled with part-time staff at lower cost to the institutions.[3] In addition, the supply of potential part-time staff exceeded demand in most geographic areas, according to a recent study[4] which also found that 70 percent of academic part-timers had secondary employment. These two factors may act together to reduce the opportunities for individual part-timers to move to new academic positions offering better pay or benefits.

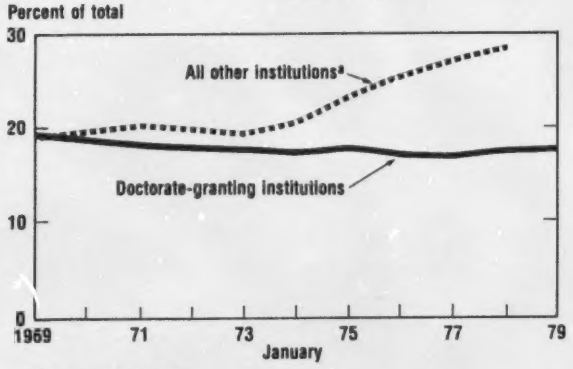
During the next decade, significant growth in S/E employment at many doctorate institutions, where two-thirds of all faculty are tenured, may be limited to increases in the number of part-time professionals working outside of the tenure track. Traditional levels of demand for new faculty are expected to decline in reaction to an end in enrollment growth and the raising of the mandatory retirement age for present faculty.[5]

Institutional Control

A 6-percent growth in S/E personnel between 1978 and 1979 occurred in public doctorate universities, while the total number of S/E professionals at private doctorates declined by less than 1 percent (chart 3). Since 1973 the S/E employment in public institutions has expanded at four times the average rate (4 percent per year) reported by private schools (1 percent per year). As a result, public universities have accounted for 88 percent of the overall S/E employment increases at doctorate institutions. The role of publicly controlled doctorate institutions in the performance of academic research has also expanded. These universities accounted for 65 percent of R&D spending in 1978 compared to 61 percent in 1973.[6]

The rising role of public institutions in the employment of S/E personnel and R&D activities occurred as the difference in the costs of education progressively widened between public and private institutions. Thus, in 1978 tuition and fees at private institutions averaged

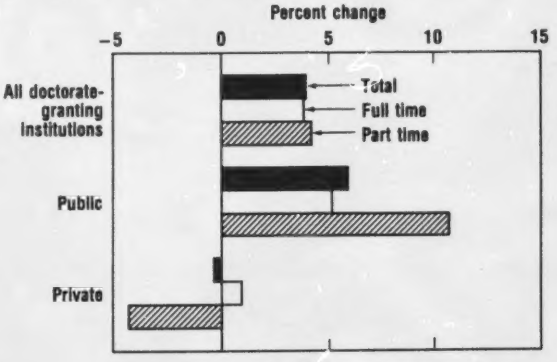
Chart 2. Part-time scientists and engineers at universities and colleges



[a]Data not available in 1979.

SOURCE: National Science Foundation

Chart 3. Scientists and engineers employed at doctorate-granting universities by institutional control and status: January 1978-79



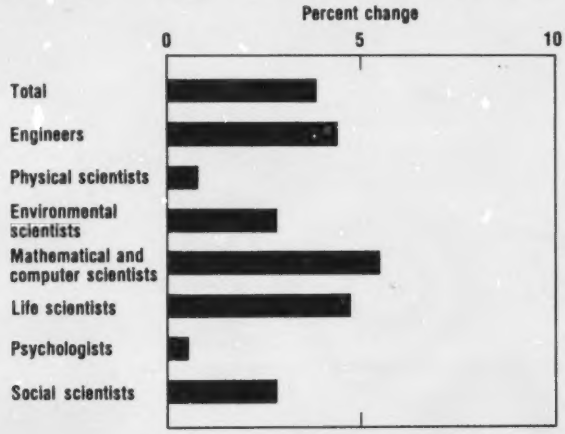
SOURCE: National Science Foundation

nearly 4½ times those at public institutions.[7] The continuation of this trend, accompanied by the forecast downturn in the number of 18- to 24-year-olds during the eighties is expected to impact more heavily upon private institutions totals since tuition and fees comprise 28 percent of current funds revenues compared to 13 percent in public institutions.[8]

Field of Science

The overall increase in S/E personnel at doctorate universities was distributed across all major S/E disciplines, ranging from 6 percent in the mathematical and computer sciences to less than 1 percent in both the physical sciences and psychology (chart 4). Part-time S/E personnel growth rates exceeded the rates for full-timers in all areas.

Chart 4. Scientists and engineers employed at doctorate-granting universities by field: January 1978-79



SOURCE: National Science Foundation

When analyzing the disciplinary distributional patterns of S/E personnel, graduate S/E enrollment, and R&D expenditures, it is evident that there has been a slight shift in resources at doctorate institutions among scientific disciplines. Between 1975 and 1979, the period for which comparable data for all three categories are available, the relative share of the environmental sciences increased in all three indicators while psychology experienced relative declines (table 1).

Future growth in S/E personnel will depend in part upon trends in employment opportunities and student interests. Current shortages in the U.S. stock of engineers and computer scientists[9] are likely to sustain student enrollment in those fields. Officials at several large R&D-performing universities confirmed that their universities are in an increasingly competitive job market for engineers and computer scientists.

Institutional Distribution

The leading 20 academic employers of S/E professionals accounted for one-fourth of the employment increase in 1979 (table 2); they accounted for 26 percent of the total number of S/E personnel employed in academe, which was consistent with levels reported throughout the seventies. These institutions also accounted for more than one-fifth of graduate S/E enrollment in fall 1978 and nearly one-third of R&D expenditures in doctorate institutions in fiscal year 1978. Among the seven major disciplines, S/E professionals were most highly concentrated in the environmental sciences where the 20 leading institutions in that field accounted for 41 percent of S/E personnel.

* * * * * * * * * *

Academic Science: Scientists and Engineers, January 1979 (Detailed Statistical Tables) (NSF 79-328) can be

Table 1. Scientists and engineers, graduate enrollment, and R&D expenditures at doctorate-granting universities by field

	Scientists and engineers		Graduate science enrollment		R&D expenditures	
	Jan. 1975	Jan. 1 /79	Fall 1974	Fall 1978	FY 1975	FY 1978
Total, all fields	180,000	207,600	267,300	312,000	$3,334,000	$4,530,100
	Percent distribution					
	100.0	100.0	100.0	100.0	100.0	100.0
Engineering	10.9	10.9	21.4	21.2	11.3	13.1
Physical sciences	9.2	8.8	9.3	8.0	10.2	10.6
Environmental sciences	2.7	3.1	3.7	3.8	7.4	8.1
Mathematical and computer sciences	6.4	6.8	7.6	6.9	2.5	2.6
Life sciences	52.7	51.9	24.9	27.3	56.4	55.5
Psychology	5.1	4.8	9.3	6.9	2.2	1.9
Social sciences	13.0	13.6	23.9	23.7	7.2	5.8
Other sciences[1]	——	——	——	——	2.8	2.4

[1]The "Other sciences" category is used only in the R&D expenditures survey for multidisciplinary projects where classification under one field is impossible.

SOURCE: National Science Foundation.

obtained from the Division of Science Resources Studies, National Science Foundation, Washington, D.C. For information on availability of data tapes, please call Moshman Associates, Inc., at 301-229-3000.

Table 2. Twenty leading doctorate-granting institutions employing scientists and engineers

Institution	Total scientists and engineers, January		Percent change
	1979	1978	
Total, all doctorate institutions	207,635	199,920	3.9
20 leading institutions	53,869	51,949	3.7
1. Harvard Univ	5,414	5,135	5.4
2. Univ of Wisconsin-Madison	3,758	3,691	1.8
3. Univ of Minnesota	3,581	3,471	3.2
4. Ohio State Univ	3,541	3,512	.1
5. Univ of Michigan	3,535	3,485	1.4
6. Louisiana State Univ System	3,011	2,535	18.8
7. Cornell Univ	2,703	2,723	-.1
8. Univ of Washington	2,545	2,586	-1.6
9. Univ of California-Los Angeles	2,451	2,413	1.6
10. Massachusetts Inst of Technology	2,449	2,425	1.0
11. Univ of Illinois-Urbana	2,232	2,310	-3.4
12. Pennsylvania State Univ	2,200	2,118	3.9
13. Texas A&M Univ	2,133	2,072	3.2
14. Univ of Florida	2,136	2,098	1.8
15. Columbia Univ-Main Division	2,075	2,028	2.3
16. Duke Univ	2,067	1,825	13.3
17. Yale Univ	2,060	1,911	7.8
18. New York Univ	2,007	1,969	1.9
19. Purdue Univ-All campuses	1,993	1,797	10.9
20. Stanford Univ	1,973	1,845	6.9

Source: National Science Foundation.

FOOTNOTES

[1]National Research Council. *Research Excellence Through the Year 2000. The Importance of Maintaining a Flow of New Faculty Into Academic Research* (Washington, D.C. 1979).

[2]Department of Health, Education, and Welfare, National Center for Education Statistics. *Projections of Education Statistics to 1986-87* (Washington, D.C.: U.S. Government Printing Office, 1978.)

[3]Howard P. Tuckman and William D. Vogler, "The 'Part' in Part-Time Wages," *AAUP Bulletin*, Vol. 64, No. 2 (Washington, D.C., May 1978.)

[4]Howard P. Tuckman, *et al*, "Part-Timers and the Academic Labor Market of the Eighties" *The American Sociologist*, Vol. 13, (Nov. 1978).

[5]Thomas M. Corwin and Paula R. Knepper, "Finance and Employment Implications of Raising the Mandatory Retirement Age for Faculty." *Policy Analysis Reports* (Washington, D.C.: American Council on Education, Dec. 1978.)

[6]National Science Foundation. *Academic Science: R&D Funds, Fiscal Year 1978* (Detailed Statistical Tables) (NSF 79-320) (Washington, D.C. 1979).

[7]Department of Health, Education, and Welfare, op. cit.

[8]Ibid, *Financial Statistics of Institutions of Higher Education, Fiscal Year 1977.*

[9]*CPC Salary Survey*, July 1979. Bethlehem, Pa.: College Placement Council.

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